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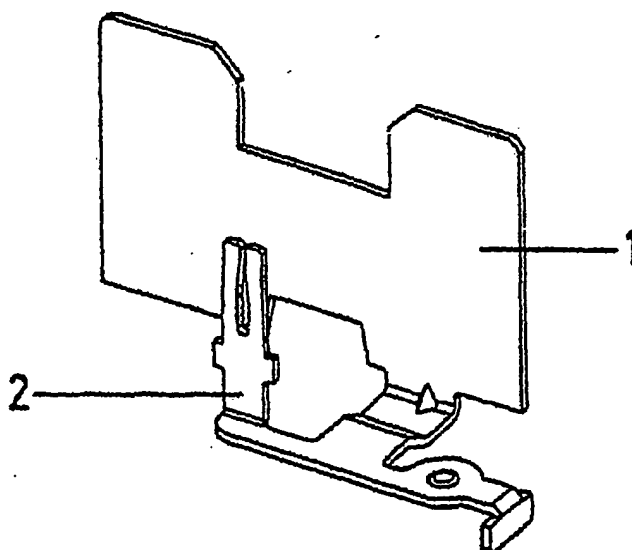
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(54) Title: MODULE FOR CONNECTION AND TESTING OF HIGH FREQUENCY TRANSMISSION LINES



(57) Abstract: Module (3) for connection and testing of high frequency transmission lines, characterised in that the module (3) includes an earthed electrically conductive (preferably metal) shield (1), which covers one side of the module sufficiently to act as a barrier against inductive effects between two or more such modules when arranged adjacent to each other (for example in an array of such modules in a connection box) with the shield between them.

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MODULE FOR CONNECTION AND TESTING OF HIGH FREQUENCY  
TRANSMISSION LINES

This invention relates to a module for connection and testing of transmission lines at high frequencies", that is frequencies of approximately 100 megahertz and higher.

The increasing use of telephone lines for transmission of data makes it necessary to operate with increasingly high frequencies, in order to obtain wider band widths. However, not all of the components originally designed for telephone service can provide an acceptable data service with performance levels required by the high frequency transmissions. In fact, when operating at high frequencies, there is accentuation of any disturbances in the transmission and reductions in the signal strength, generally in direct proportion to the increasing frequency.

These undesirable frequency effects include:

- a) Attenuation, which consists of loss of power of the signal, in a manner which is directly proportional to the distance of transmission and the frequency. This attenuation is measured as decibels lost per 100 m (dB/100m).
- b) The diaphony of "next" (cross-talk) which occurs when the signal of a transmission line pair is filtered or connected to another adjacent pair and takes the form of noise. The generation of cross-talk noise increases with increasing frequency, but the transmission of this cross-talk noise along the adjacent pair is also subject to attenuation, measured as dB/100m, which attenuation also increases with the frequency. Thus, there is a complex relationship between generation and attenuation of cross-talk noise with increasing frequency. In a voice line, diaphony (cross-talk) is inconvenient, but in a data transmission line it is seriously disruptive, making the content and interpretation of the signal unreliable. Consequently it is desirable to reduce its presence and effect to a minimum.

International standards have been established which make it possible to classify electrical components in categories according to their performance against standardised values of attenuation and cross-talk at difference frequencies, and Category 5 is obtained if there is compliance with the standards at frequencies of up to 100 Mhz. Known modules

for connection and testing of telephone lines, for example as described in EP-B-0711012, do not comply with the standards in question at such frequencies, and consequently, it is impossible on these lines to obtain the Category 5 rating required at present for the components of many transmission networks.

The purpose of the present invention is to provide a module for connection and testing of transmission lines, which can operate at high frequencies of at least 100 MHz, and which complies with the values attributed to attenuation and diaphony in the standards which correspond to Category 5.

The main concept for functional effectiveness of this module consists of separation of adjacent modules in line connection boxes by incorporation of earthed metal shields on one side of each module. Consequently, the design includes the means for establishing electrical continuity between the protective shield and the earthing electrode, which is obtained by means of a configuration in a single piece, suitably shaped by stamping (cutting and folding) of the metal shield and the earthing terminal.

The effectiveness of the solution described has been analysed in a laboratory, and it has been proved that the shielded module complies with all the technical requirements necessary for its classification in Category 5, i.e. with operation at frequencies of at least 100 MHz.

In order to further illustrate the invention, drawings of a specific embodiment are attached by way of example, which represent schematically different aspects of the shielded module. In these drawings:

Figure 1 is a perspective view of the shielded module, seen from the side protected by the metal shield; and

Figure 2 is a perspective view of the single piece formed by the metal shield and the earthing terminal.

Referring to the drawings, the module (3) is of the aforementioned type described in EP-B-0711012 having connection means for forming connections to the line conductors,

cut-off means comprising an extractable electrical continuity part of the module, and circuit-protection means connected to an earthing terminal (preferably by connection to the latter of a protective terminal which surrounds it) for protection against excess voltages. The circuit protection means preferably comprises an ionised noble gas discharger. In preferred constructions, the circuit protection means is joined to, preferably carried by, the extractable continuity part of the module.

Each module (3) includes a flat metal screen (1) which is earthed, and at least partly covers one of the sides of the module, such as to create a barrier against inductive effects between each two adjacent modules in a connection box. Electrical continuity between the protective shield and the earthing electrode is established by making the metal shield (1) and the earthing terminal (2) as a single piece, for example by stamping and bending of sheet metal. The earthing terminal (2) is inserted (preferably potted) into the body of the module, as known per se from existing modules, to make contact in use with the central earthing electrode (not shown) of the extractable continuity part, shown in these drawings with an upwardly projecting knob or handle for convenient manual disconnection of the circuits. Also as known per se, metal conductors (not shown) connect the wires to be inserted in the twin apertures at either end of the module to the bridging conductors (not shown) in the continuity part, which also holds a circuit protection gas discharge tube (not shown) connected between the bridging conductors and the central earthing electrode.

**CLAIMS**

1. Module (3) for connection and testing of high frequency transmission lines, characterised in that the module (3) includes an earthed electrically conductive (preferably metal) shield (1), which covers one side of the module sufficiently to act as a barrier against inductive effects between two or more such modules when arranged adjacent to each other (for example in an array of such modules in a connection box) with the shield between them.
2. Module according to Claim 1, characterised in that electrical continuity between the protective shield (1) and an earthing electrode (2) is established by forming them integrally, preferably as a single piece of metal.
3. Module according to claim 2, characterised in that the shield is secured to the module at least partly by insertion and retention (preferably by potting) of the earthing electrode in the body of the module and/or at least partly by gripping of part of the module between the shield and the earthing electrode.
4. Module according to any preceding claim, wherein the said shield is substantially flat.
5. Module according to any preceding claim, being of the type (known per se) having connection means for forming connections to the line conductors, cut-off means comprising an extractable electrical continuity part of the module, and circuit-protection means connected to an earthing terminal (preferably by connection to the latter of a protective terminal which surrounds it) for protection against excess voltages.
6. Module according to claim 5, wherein the circuit protection means comprises an ionised noble gas discharger.
7. Module according to claim 5 or 6, wherein the circuit protection means is joined to, preferably carried by, the extractable continuity part of the module.

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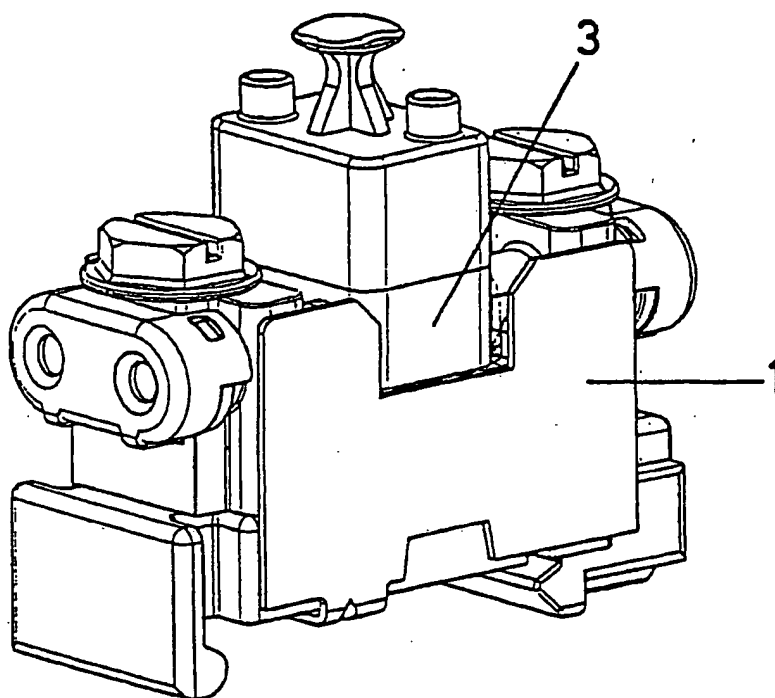


FIG.1

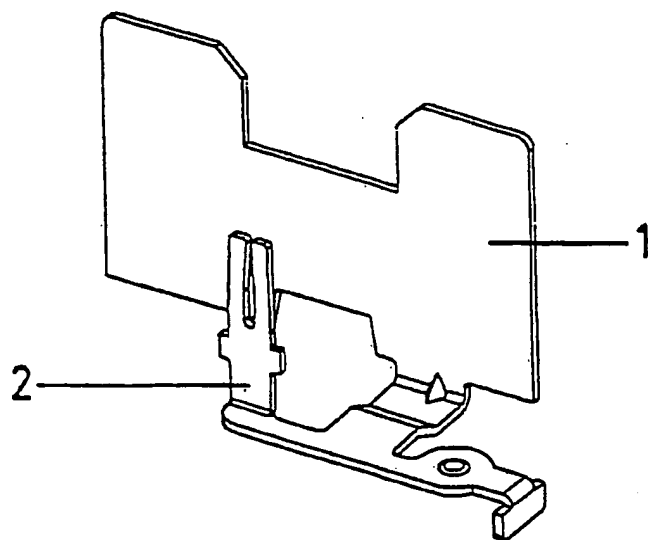


FIG.2

# INTERNATIONAL SEARCH REPORT

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<b>A CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 H04B3/46 H05K9/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 7 H04B H05K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) WPI Data, PAJ, EPO-Internal		
<b>C DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 4 800 463 A (FERCHAU JOERG U ET AL) 24 January 1989 (1989-01-24) column 3, line 43 -column 4, line 6	1-4
A	PATENT ABSTRACTS OF JAPAN vol 1997, no 11, 28 November 1997 (1997-11-28) & JP 09 180085 A (KOKUSAI ELECTRIC CO LTD), 11 July 1997 (1997-07-11) abstract	1-7
<input type="checkbox"/> Further documents are listed in the continuation of box C <input checked="" type="checkbox"/> Patent family members are listed in annex		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents such combination being obvious to a person skilled in the art "Z" document member of the same patent family		
Date of the actual completion of the international search 22 September 2000		Date of mailing of the international search report 04/10/2000
Name and mailing address of the ISA European Patent Office P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Tx 31 851 epo nl, Fax: (+31-70) 340-3018		Authorized officer De Iulius, M

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4800463	A	24-01-1989	NONE	
JP 09180085	A	11-07-1997	NONE	